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REPORT EM 1292

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MSTS TEST REPORT

RUNS 95-420, 421, 422-SP1

SPECIAL TEST 1

PREPARED BY

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ISSUED: 14 AUGUST 1959

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SECTION 1

Summary

Run 420 at Test Stand 1-95, 29 July, was an unsuccessful attempt to accomplish Test No. 9. Prior to Run 421, it was decided to close out Block II testing and proceed with Special Test No. 1, comprised of Runs 421 and 422. These two runs were performed satisfactorily on 30 July 1959.

Both 421 and 422 were integrated propellant loading tests, at IOC rates, with the Acoustica system properly controlling the loading sequences. GO2 samples were taken during LO2 tanking and detanking periods for determination of GN2 contamination.

The engine LO2 tank full instrumentation indicated the tank was filled at 18 minutes after fuel load start.

Booster helium bottle temperature and pressure requirements for 65-2 were achieved for Runs 420, 421 and 422 (see He/LN2 System Analysis for discussion). Helium load start was delayed 2 minutes after load start during Run 420. The average temperature attained during Run 420 at 13.0 minutes was -297 DGF with 3070 psig in the booster helium bottles. Prior to Run 421, the line from the inline heat exchanger to the ground disconnect was insulated in an attempt to satisfy 65-2 requirements (3000 psig and -295 DGF at 13.5 minutes in the booster helium bottles). Helium load start was delayed 3 minutes after load start during Runs 421 and 422. The average temperature attained during Run 421 at 13 minutes was -299 DGF with 3080 psig in the booster helium bottles. The orifice in the inline heat exchanger was removed prior to Run 422. The average temperature attained at 13 minutes was -305 DGF with 3040 psig in the booster helium bottles. The characteristic pressure droop again occurred prior to PS-80 cutoff point, recovering to 3000 psig at 10.9 and 13.00 minutes on Run 420 and 421 respectively. There was no pressure droop during Run 422.

The remaining portion of the LO2 topping line, booster "Y" duct to the booster pump inlet, LO2 staging valve, and LO2 airborne fill and drain valve were insulated prior to Run 421 in an attempt to maintain the desired -291 DGF at the LO2 recirculator in, prior to launch time. LO2 topping was not initiated after LO2 tanking was completed. However, the temperature at the LO2 recirculator in (P1925T) remained below -291 DGF during LO2 tanking and detanking. LO2 detanking was performed under sequence III pressurization to the 90% missile tank level, then normally from 90% to 0%.

The insulation on the booster "Y" duct and LO2 airborne fill and drain valve was removed prior to Run 422 to further evaluate effects of the LO2 recirculator in temperature. The LO2 recirculator in temperature (P1925T) remained below -291 DGF until 7.35 minutes of the 15 minute LO2 topping hold, then increased to -279 DGF. The temperature decreased to below -291 DGF at 10.15 min-

utes of the topping hold and remained throughout Sequence III pressurization and detanking. LO2 detanking was again performed under sequence III pressurization to the 90% missile tank level then normally from 90% to 0%. The LO2 topping system was unable to maintain the LO2 level during the 15 minute hold with the LO2 weight dropping 370 pounds. The wind velocity was averaging 5 knots at this time.

Oscillation of missile LO2 tank pressure during sequence III pressurization occurred during Run 421 as during Run 418. This oscillation continued until the 90% missile LO2 tank level was attained during detanking and the LO2 missile tank pressure was restepped to standby pressure. Oscillation of missile LO2 tank pressure during sequence III pressurization did not occur during Run 422.

SECTION 2

Fuel Loading System

The performance of the fuel loading system was satisfactory for Runs 420, 421 and 422. During Run 420 the Acoustica 95% FU fail probe activated prior to rapid load valve open, preventing the valve from opening. Fuel loading was manually terminated at 2.54 minutes. 4900 pounds of fuel were tanked at a fine load flow rate of 400 GPM.

During Run 421 fuel loading was terminated by the Acoustica 100% fuel probe at 6.72 minutes. The maximum fuel flow rate was 4600 GPM, tanking 76,980 pounds of fuel.

During Run 422 fuel loading was terminated by the Acoustica 100% fuel probe at 6.39 minutes. The maximum fuel flow rate was 4600 GPM, tanking 77,030 pounds of fuel.

The data for the fuel tank head in GPM and fuel storage tank pressure in psig is summarized below.

			Fuel Loading Sequence			
			Rapid			Fine
Meas No	Description	Unit	Start	Ave	End	Ave
421						
U1902P	Fuel Tank HD	GPM	*4600	*4215	*3830	*420
F1953P	Fuel Stk Press	PSIG	113.0	111.5	110	113.0
422						
U1902P	Fuel Tank HD	GPM	*4600	*4260	*3920	*400
F1953P	Fuel Stk Press	PSIG	113.5	111.5	110.5	114.1

*Calculated over one minute interval.

SECTION 3

LO2 Loading System

The performance of the LO2 loading system was satisfactory for Runs 421 and 422. LO2 loading was not initiated during Run 420 due to the early termination of fuel loading.

During Run 421, LO2 loading was terminated by the 100% LO2 probe at 12.41 minutes. The maximum LO2 flow rate was 5800 GPM, tanking 174,720 pounds of LO2. The loading time was longer than normal due to a slow storage tank pressurization flow between 22.5 and 35 psig. When LO2 load start is depressed the storage tank pressure increases slowly to 35 psig. When 35 psig is achieved a pressure switch picks up and allows rapid pressurization to maximum storage tank pressure.

During Run 422 LO2 loading was terminated by the 100% LO2 probe at 11.67 minutes. The maximum LO2 flow rate was 5800 GPM, tanking 174,720 pounds of LO2.

The engine LO2 tank full signal was received at 18.00 minutes on Run 421 and 422.

The data from LO2 tank head in GPM and LO2 storage tank pressure in psig is summarized below.

421 LO2 Loading Sequence

Meas.No.	Description	Unit	Rapid Start	Rapid Ave.	Rapid End	Fine Ave.
U1901P	LO2 Tank HD	GPM	*5800	*5600	*5420	*[illegible]
F1952P	LO2 Stk Press	PSIG	102.7	102.7	102.7	103.[illegible]
422						
U1901P	LO2 Tank HD	GPM	*5800	*5600	*5420	*750
F1952P	LO2 Stk Press	PSIG	103.7	102.7	102.7	103.0

* Calculated over one minute interval.

LO2 Topping System

LO2 topping was not initiated during Run 420 due to the early termination of fuel loading. LO2 topping was terminated at the end of LO2 loading, during Run 421. The LO2 recirculator in temperature (P1925T) was below -291 DGF during LO2 rapid load, fine load, and detanking. Prior to Run 421 the following items were insulated in an attempt to maintain the desired temperature of -291 DGF: (1) The remaining portion of the LO2 topping line, (2) The line from the booster "Y" duct to the booster pump inlet, (3) The LO2 staging valve, (4) The LO2 airborne fill and drain valve.

The LO2 topping system maintained 100% full LO2 missile tank level until 9.22 minutes of the LO2 topping hold during Run 422. The level decreased from 174,790 pounds at this time of 174,420 at the end of the 15 minute hold. The wind velocity was averaging 5 knots during the 15 minute hold. The LO2 recirulator in temperature (P1925T) was below -291 DGF during LO2 rapid load increasing to -279 DGF at 7.35 of the LO2 topping hold. The temperature then decreased to below -291 DGF at 10.15 minutes of the hold. The temperature remained below -291 DGF throughout sequence III pressurization and during detanking. The LO2 topping flow meter was not instrumented due to the flow meter hanging up on previous runs. However, the differential pressure across the LO2 subcooler (P1816P) indicated the LO2 topping valve was cycling between the open and closed position for the first 10.57 minutes of the 15 minute LO2 topping hold. The valve then went to the full open position (25 GPM) for the remainder of the topping hold. Prior to Run 422, insulation was removed from the following items: (1) The booster "Y" duct, (2) The LO2 airborne fill and drain valve. See graph for details of the LO2 recirculator in temperature (P1925T) during Runs 421 and 422, Figure 5.

GO2 Sampling System

GO2 samples were taken during LO2 tanking and detanking on Runs 421 and 422. Samples were not taken during 420 due to premature run termination. The samples during Runs 421 and 422 were taken at specified levels for determination of GN2 contamination. See Table 1 for sample analysis.

SECTION 4

HE/LN2 System Performance

Summary:

HE/LN2 system performance was satisfactory during Runs 420, 421, and 422. These are three consecutive runs on which 65-2 requirements (as outlined in SANERB 7-85 dated 7-17-59) have been achieved. Prior to these runs the resistance bulb instrumentation system reliability had been improved. The bottle temperature data now appears valid, however, the possible overall system error (± 3%) is greater than the desired(±1%). The pre and post test span and balance checks were within ± 1.5% of the set value on all 3 tests. Temperatures prior to helium dump have also been within the system accuracy. Further tests with an improved instrumentation system are planned concurrently with the pump program.

The inline heat exchanger performance was satisfactory during all three runs. Both heat exchanger and line insulation improved system performance, as expected. There has been a large temperature rise in the uninsulated line between F1744T and F1894T. This can probably be attributed to the heat absorbed in chilling the large mass of metal in the heavy wall tubing between the heat exchanger outlet and the stub-up. See heat exchanger graphs for data.

The characteristic droop in booster bottle pressure was repeated during Runs 420 and 421 but not during Run 422. A history of pressure droop data is tabulated in Table 2.

The HE/LN2 system performance data is tabulated in Table 1 and in the time slice tab.

Run 420:

HE/LN2 system performance was satisfactory. System configuration remained the same for this test. Helium load start was delayed 2 minutes after fuel load start as planned. Booster bottle temperature and pressure requirements for 65-2 were achieved during this run. The booster bottle temperatures appear to be valid. The pre and post test span and balance checks agree and are within 1% of the set value.

The characteristic droop in booster bottle pressure was repeated. The first pressure peak was 2700 PSIG at 7.62 minutes. The pressure then dropped to 2570 PSIG at 8.5 minutes. The steady state pressure of 3070 PSIG was achieved at 10.9 minutes. This problem is still under investigation.

The inline heat exchanger performance was satisfactory. The three temperature measurements required for an evaluation of the heat exchanger (F1744T, F1894T, and F1910T) were obtained.
No explanation can be given for heat exchanger out temperature being warmer than helium at the stub-up during Run 419. The heat exchanger is still under evaluation.

Run 421:

HE/LN2 system performance was satisfactory. Helium load start was delayed 3 minutes after fuel load start as planned. Booster bottle temperature and pressure requirements for 65-2 were achieved during this run. The booster bottle temperatures appear to be valid. The pre and post test span and balance checks agree and are within 1% of the set value.

The characteristic droop in booster bottle pressure was repeated. The first pressure peak was 2640 PSIG at 9.33 minutes. The pressure then dropped to 2575 PSIG at 10.2 minutes. The steady state pressure of 3080 PSIG was achieved at 13 minutes. This problem is still under investigation.

The inline heat exchanger performance was satisfactory. The helium line from the heat exchanger outlet to the ground disconnect was insulated prior to this run. The three temperature measurements required for an evaluation of the heat exchanger (F1744T, F1894T, and F1910T) were obtained. The heat exchanger is still under evaluation.

Run 422:

HE/LN2 system performance was satisfactory. Booster bottle temperature and pressure requirements for 65-2 were achieved during this run. Helium load start was delayed 3 minutes after fuel load start as planned. This is the third consecutive run on which 65-2 requirements (as outlined in SANERB 7-85 dated 7-17-59) have been achieved.

The upper and lower booster temperatures at 13 minutes were -299 DGF and -310 DGF respectively. The lower bottle temperature (F1297T) indicated -325 DGF just prior to helium dump. This discrepancy is well within allowable instrumentation error.

There was no pressure droop during this run. The only attempt to remedy this droop problem was to manually exercise PT-21 just prior to the run for about 5 minutes. This "fix" will be attempted for the next run. A report will be made on further developments concerning this problem.

The inline heat exchanger performance was satisfactory. The three temperatures measurements required for an evaluation of the heat exchanger (F1744T, F1894T, and F1910T) were obtained. The orifice in the heat exchanger LN2 vent was removed prior to this run. The heat exchanger outlet temperature (F1910T) has been progressively colder at comparative times during helium loading. This indicates the effectiveness of the helium line insulation and increased LN2 flow. A heat exchanger evaluation will continue.

It should be noted that a complete evaluation of the temperature instrumentation will be made to determine system accuracy. This evaluation is planned after the completion of Block II testing.

SECTION 5

Convair Propellant Loading Control Systems

Convair PLCU System:

The Convair propellant loading control system was not installed for this run. The unit was IR'd prior to Run 419 and has been sent to San Diego. The fuel density was 50.3 pounds per cubic foot on both Run 421 and 422. Fuel density was not taken on Run 420 due to the short duration of this run.

Convair PU System:

The Convair PU system operated in an open loop configuration during Run 421 and 422. On Run 421 the error ratio demod output signal (U1091V) indicated that the LO2 tank was 90% full when the Acoustica 90% probe signalled rapid load stop. When the Acoustica 99.8% probe signalled fine load stop the error demod output indicated a level of 104.7% full. On Run 422 the error ratio demod output signal (U1091V) indicated that the LO2 tank was 91.0% full when the 90% probe signalled rapid load stop. When the Acoustica 99.8% probe signalled fine load stop the error demod output indicated a level of 104.7% full.

SECTION 6

Acoustica Propellant Loading Control System

The Acoustica propellant loading control system did not perform satisfactorily during the fuel loading sequence of Run 420. The Acoustica 95% probe gave an emergency rapid fuel closed signal at 1.87 minutes. Fine load stop and Run termination was manually accomplished at 2.54 minutes. The 95% probe gave an intermittant signal from the time of rapid fuel load stop to fuel fine load stop.

Post test examination showed the 95% level control unit to be operating satisfactorily.

The Acoustica propellant loading control system performed satisfactorily during the LO2 and fuel loading sequences of Runs 421 and 422. During these runs the Acoustica system and the total and partial delta pressure measurements agreed within 1%. The fuel 90% probe signalled rapid load stop, and the fuel 100% probe signalled fine load stop. The LO2 90% probe signalled rapid LO2 load stop and the LO2 99.8% probe signalled LO2 fine load stop. Topping was not attempted on Run 421 so performance of the topping probe is not available on this run. The Acoustica topping probe signalled properly to control the LO2 level on Run 422. The Acoustica string B probes did not function properly during these tests. These probes are not a primary requirement so no attempt will be made to determine the trouble. The LO2 and fuel 95% probes were properly locked out when the signal from the 90% probes were sent. A special check was made on the 90% probe during these tests. The LO2 tank was detanked under flight pressure to 90% level, then detanked the remainder of the way under Sequence I pressure. The detanking levels are tabulated in Tables 4 and 5, which compare data from the Acoustica propellant loading system to all other propellant sensing systems. The percentage values are computed using 2487.8 cubic feet as 100% for LO2 and 1527.4 cubic feet as 100% for fuel.

SECTIONS 7, 8

Missile Pressurization System

The missile tank pressurization system performance was satisfactory during Runs 420, 421 and 422. Tank pressures were mainted within the prescribed limits in all sequences. Sequence III pressurization was not initiated during Run 420 due to early termination of the run.

Pressure oscillations were noted during the Sequence III pressurization of Run 421. This oscillation is due to the initial small ullage space in the LO2 missile tank during Sequence III pressurization. Detanking of LO2 was performed under Sequence III pressurization. Missile tank pressure oscillation damped out gradually as the LO2 tank level was decreased to 90%. When standby pressure was initiated at this level the oscillation disappeared.

No Sequence III pressure oscillation occurred during Run 422. LO2 was detanked to the 90% level under Sequence III pressure, after which detanking was completed at Sequence II-L pressures.

Operation of the LO2 boiloff valve P/N 27-80588-811 was satisfactory during all three runs.

Ground Support Equipment

The performance of the ground support equipment during Runs 420, 421 and 422 was satisfactory.

SECTION 9

Data

Time slice and EA sequence data are tabulated on the following pages. Where a number and letter (i.e.: 7B) appear instead of a numerical value in the time slice tab, data was not obtained. For the reason, see the malfunction code on page 30.

1-95 420 TIME SLICE DATA

MEAS #	DESCRIPTION	UNIT	REC	0	TIME IN MIN 2	11	13
F1001P	LO2 TANK HELIUM	PSIG	L/N	2.2	2.2	2.2	2.2
F1003P	FUEL TANK HELIUM	PSIG	L/N	10	25.1	25.7	25.7
F1066P	GO2 BO LN @ ELBOW	PSIG	L/N	2.0	2.0	2.0	2.0
F1246P	S TK HE BTLS H1	PSIG	BRN	150	140	3070	3070
F1248P	S TK HE BTLS H1	PSIG	BRN	240	240	3030	3090
F1291P	S CTL BTL H1	PSIG	BRN	240	240	2990	3010
F1770P	LN2 STK ULL	PSIG	L/N	0	116	112	112
F1952P	LO2 STOR TK PR	PSIG	BRN	0	0	0	0
F1953P	FUEL STORAGE TK PR	PSIG	BRN	6	113	110	110
F1105R	LN2 FLOW	GPM	L/N	0	95	98	98
F1004T	FUEL TANK HE	DGF	BRN	103	148	126	125
F1064T	GO2 BO @ ELBOW	DGF	BRN	100	100	100	100
F1247T	S TK HE BTL	DGF	BRN	80	80	-279	-292
F1290T	SUS CTL HE BTLS	DGF	BRN	94	93	43	45
F1297T	S TK HE BTLS	DGF	BRN	81	73	-290	-304
F1729T	FUEL PRESS GAS	DGF	BRN	92	72	62	65
F1744T	HE-LN2 HT EXCH OUT	DGF	BRN	39	39	-302	-298
F1805T	PRESS GAS MAN	DGF	BRN	84	82	64	61
F1694T	HE LINE AT STUB UP	DGF	BRN	78	78	-274	-259
F1910T	IN LINE EXT OUT	DGF	L/N	85	87	-280	-273
N1980T	TEMP TO SAMPLE BTL	DGF	L/N	65	65	65	65
P1001P	B1 LO2 PUMP IN	PSIG	L/N	2.1	2.1	2.1	2.1
P1672P	VERN FUL TK DIF	PID	BRN	1.9	1.8	1.8	1.8
P1682P	PRESS DIF ON LO2 TK	PID	BRN	0	0	0	0
P1683P	PR DIF FUEL TK	PID	BRN	0	0	0	0
P1814P	LO2 TPG VLV	PID	BRN	1.98	1.98	1.98	1.98
P1816P	LO2 SUBCOOLER	PID	BRN	-.49	-.49	-.49	-.49
P1819P	D PRESS LO2 FILT	PID	BRN	-.49	-.49	-.49	-.49
P1900P	LAUNCHER INLET LO2	PSIG	BRN	1.5	1.5	1.5	1.5
P1950P	LAUNCHER INLET FUEL	PSIG	BRN	11.3	33.0	38.0	39.0
P1245R	T SYS FUEL FR	GPM	L/N	0	400	0	0
P1993R	LO2 TPG FLOW	GPM	L/N	7F	7F	7F	7F
P1020T	B1 LO2 P IN	DGF	BRN	*			
P1054T	B2 LO2 P IN	DGF	BRN	*			
P1530T	SUS LO2 P IN	DGF	BRN	*			
P1700T	FUL STK DISCH	DGF	BRN	90	90	89	88
P1862T	LO2 SUBCOOLER OUT	DGF	BRN	*			
P1869T	LO2 TPG DISCH	DGF	BRN	*			
P1887T	ENG COMP AMB BYCONE	DGF	BRN	87	84	62	62
P1883T	VERN CTL MAN ENV	DGF	BRN	94	92	82	79
P1889T	VERN CTL MAN METAL	DGF	BRN	92	92	82	79
P1903T	LAUNCHER LO2 IN	DGF	BRN	78	78	78	78
P1904T	B2 LO2 PMP VLVTE EXT	DGF	BRN	85	85	78	78

1-95 420 TIME SLICE DATA

MEAS #	DESCRIPTION	UNIT	REC	TIME 0	IN 2	MIN 11	[illegible]
P1905T	B1 LO2 PMP VOL IN	DGF	BRN	78	78	78	7[illegible]
P1906T	B2 LO2 PMP VOL IN	DGF	BRN	1A	1A	1A	1[illegible]
P1907T	B1 LO2 PMP VLVTE EXT	DGF	BRN	85	85	78	7[illegible]
P1912T	LAUNCHER LO2 OUT	DGF	BRN	*			
P1925T	LO2 RECIRC IN	DGF	BRN	78	78	78	7[illegible]
U1901P	LO2 TK HEAD	%FUL	BRN	0	0	0	0
U1902P	FUL TK HEAD	%FUL	BRN	0	5.9	9.0	9.0
U1091V	ERROR RAT DMOD OTP	VDC	BRN	*			

* NOTE

LO2 NOT TANKED
THIS TEST

195 420 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	2	N1901X	F PREPRES 1 VLV CLSD		X
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.01	13	N1917X	F GRD F/D VLV CLSD		X
0.01	48	N1926X	LO2 TK VENT VLV CLSD		X
0.01	58	N1962X	LO2 DRN START SW		X
0.01	72	N1895X	LN2 STK VENT VLV NCL		X
0.02	9	N1913X	F PREPRESS VLV 1 OPN		X
0.02	69	N1892X	LN2 LOAD VLV CLSD		X
0.03	14	N1918X	F GND F/D VLV OPEN		X
0.03	70	N1893X	LN2 LOAD VLV OPN		X
0.03	71	N1894X	LN2 STK P VLV CLSD		X
0.42	8	N1912X	FUEL LOAD START SW		X
0.43	3	N1902X	F FINE LOAD VLV CLSD		X
0.43	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.43	11	P1966X	F MSL F/D VLV CLSD		X
0.43	15	N1919X	F STK PRESS CLSD		X
0.44	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.44	10	N1914X	F FINE LOAD VLV OPEN		X
0.47	12	P1967X	F MSL F/D VLV OPEN		X
0.47	26	N1890X	INTER FUL STK PRESS	X	
0.57	15	N1919X	F STK PRESS CLSD	X	
1.00	17	N1922X	FUL RAPID LD SIGNAL		X
1.58	71	N1894X	LN2 STK P VLV CLSD	X	
1.87	28	N1970X	AA FUEL 95% PROBE	X	
1.87	28	N1970X	AA FUEL 95% PROBE		X
2.02	68	F1897X	FLIGHT HE 1 VLV CLSD		X
2.04	68	F1897X	FLIGHT HE 1 VLV CLSD	X	
2.27	28	N1970X	AA FUEL 95% PROBE	X	
2.27	28	N1970X	AA FUEL 95% PROBE		X
2.29	28	N1970X	AA FUEL 95% PROBE	X	
2.29	28	N1970X	AA FUEL 95% PROBE		X
2.54	10	N1914X	F FINE LOAD VLV OPEN	X	
2.54	12	P1967X	F MSL F/D VLV OPEN	X	
2.55	3	N1902X	F FINE LOAD VLV CLSD	X	
2.55	11	P1966X	F MSL F/D VLV CLSD	X	
2.55	14	N1918X	F GND F/D VLV OPEN	X	
2.58	13	N1917X	F GRD F/D VLV CLSD	X	

195 420 SEQ DATA

NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

4	N1903X	FUL RAPID LD VLV OPN
18	N1923X	FUL RAPID VLV CLSD
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
42	N1905X	L RAPID LD VLV OPEN
43	N1906X	LO2 FINE LD VLV CLSD
44	N1907X	LO2 STK P VLV A CLSD
45	P1988X	MSL LO2 @ 95%
46	P1998X	MSL LO2 @ 100%
49	N1929X	LO2 GND F/D VLV CLSD
50	N1930X	LO2 GND F/D VLV OPEN
51	N1931X	LO2 FINE LD VLV OPEN
52	N1932X	LO2 TOPPING VLV CLSD
53	N1933X	LO2 TOPPING VLV OPEN
54	N1934X	L RAPID LD VLV CLSD
56	N1949X	LO2 LN LIQ DET/INTRM
57	N1951X	PRESS DUCT FUEL SNSR
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN
62	N1966X	LO2 DRAIN COMPLETE
63	N1967X	LO2 MSL F/D VLV OPEN
64	N1968X	LO2 MSL F/D VLV CLSD
66	N1891X	LO2 NOT IN UPPER LN

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
6	P1999X	MSL FUELED 100%
7	N1911X	EMER MSL PRESS COND
16	N1921X	FUEL LOADING PRESS
19	N1943X	F LN LIQ DET/INTERM
20	N1955X	FUEL DRAIN START SW
25	N1965X	FUL DRAIN COMPLETE
27	N1969X	AA FUEL 90% PROBE
29	N1971X	AA FUEL 100% PROBE
30	N1972X	AA FUEL 99.89% PROBE
31	N1973X	HW LO2 RAPID SIG/90%
32	N1974X	HW LO2 BU 95% SIG
33	N1975X	HW LO2 FIN SIG 99%
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%

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37	P1890X	HW PROBE @ STA 700
38	P1891X	AA PROBE @ STA 700
39	P1892X	HW PROBE @ STA 793
40	P1893X	AA PROBE @ STA 793
55	N1936X	LO2 LOADING PRESS
65	N1889X	INTER LO2 STK PRESS
67	F1896X	LN2 INFLIGHT HE LOAD
73	P1673X	LO2 ST TK FULL
74	P1894X	LO2 95% EMERG COF
75	P1895X	AA PROBE @ STA 866
76	P1896X	HW PROBE @ STA 886
77	P1897X	AA PROBE @ STA 886
78	P1898X	HW PROBE @ STA 910
79	P1899X	AA PROBE @ STA 910

1-95 421 DATE 7-30-59

MEAS #	DESCRIPTION	UNIT	REC	0	TIME IN MIN 3	5	8	11	13
F1001P	LO2 TANK HELIUM	PSIG	L/N	2.4	2.7	2.2	2.9	3.0	25.3
F1003P	FUEL TANK HELIUM	PSIG	L/N	9.6	28.2	26.6	57.2	57.2	57.5
F1066P	GO2 BO LN @ ELBOW	PSIG	L/N	2.3	2.0	2.0	2.3	2.6	25.6
F1246P	B TK HE BTLS H1	PSIG	BRN	80	90	1140	2080	2680	3060
F1248P	S TK HE BTLS H1	PSIG	BRN	140	150	1140	2090	2640	3050
F1291P	S CTL BTL H1	PSIG	BRN	130	130	1140	2070	2660	3070
F1770P	LN2 STK ULL	PSIG	L/N	0	115	113	113	113	112
F1952P	LO2 STOR TK PR	PSIG	BRN	0	18	18	29	103	104
F1953P	FUEL STORAGE TK PR	PSIG	BRN	11	111	113	117	117	117
F1105R	LN2 FLOW	GPM	L/N	0	96	98	97	99	99
F1004T	FUEL TANK HE	DGF	BRN	109	128	94	88	88	88
F1064T	GO2 BO @ ELBOW	DGF	BRN	99	114	-227	-208	-214	-233
F1247T	B TK HE BTL	DGF	BRN	84	32	-132	-266	-288	-295
F1290T	SUS CTL HE BTLS	DGF	BRN	96	95	98	58	31	25
F1297T	B TK HE BTLS	DGF	BRN	76	8	-91	-288	-303	-306
F1739T	FUEL PRESS GAS	DGF	BRN	94	73	85	62	63	65
F1744T	HE-LN2 HT EXCH OUT	DGF	BRN	33	35	-298	-303	-303	-302
F1805T	PRESS GAS MAN	DGF	BRN	85	84	84	81	63	61
F1894T	HE LINE AT STUB UP	DGF	BRN	78	78	-230	-269	-267	-270
F1910T	IN LINE EXT OUT	DGF	L/N	75	42	-252	-268	-270	-275
N1980T	TEMP TO SAMPLE BTL	DGF	BRN	66	66	65	65	55	54
N1983T	FULL FUEL PRESS BTL	DGF	BRN	95	96	95	93	92	90
P1001P	B1 LO2 PUMP IN	PSIG	L/N	2	7	7	15	27	48
P1672P	VERN FUL TK DIF	PID	BRN	0.23	0	-0.8	0.5	0.5	0.5
P1682P	PRESS DIF ON LO2 TK	PID	BRN	0	0	0	0	0	1.7
P1683P	PR DIF FUEL TK	PID	BRN	0	0	0.6	1.1	1.2	1.2
P1814P	LO2 TPG VLV	PID	BRN	1.0	1.0	6.6	4.0	7.1	92.1
P1816P	LO2 SUBCOOLER	PID	BRN	-0.6	0.4	4.5	78	78	1.0
P1819P	D PRESS LO2 FILT	PID	BRN	0	0	0.5	3.0	0	-0.3
P1900P	LAUNCHER INLET LO2	PSIG	BRN	1.5	21	14	54	37	5
P1950P	LAUNCHER INLET FUEL	PSIG	L/N	9	80	41	14	14	14
P1245R	T SYS FUEL FR	GPM	L/N	0	4080	440	0	0	0
P1020T	B1 LO2 P IN	DGF	BRN	78	-291	-291	-287	-293	-289
P1054T	B2 LO2 P IN	DGF	BRN	78	-290	-292	-288	-290	-285
P1530T	SUS LO2 P IN	DGF	BRN	78	-292	-292	-284	78	78
P1700T	FUL STK DISCH	DGF	BRN	92	90	90	88	90	88
P1862T	LO2 SUBCOOLER OUT	DGF	BRN	78	-165	-241	-276	-284	-285
P1869T	LO2 TPG DISCH	DGF	BRN	83	-106	-252	-263	-283	-276
P1887T	ENG COMP AMB BYCONE	DGF	BRN	90	75	63	54	49	45
P1888T	VERN CTL MAN ENV	DGF	BRN	95	95	90	86	82	79
P1889T	VERN CTL MAN METAL	DGF	BRN	95	92	90	85	82	78
P1903T	LAUNCHER LO2 IN	DGF	BRN	78	-211	-242	-269	-277	-274
P1904T	B2 LO2 PMP VOL EXT	DGF	BRN	93	90	76	67	52	48

1-95 421 DATE 7-30-59

MEAS #	DESCRIPTION	UNIT	REC	TIME IN MIN 0	3	5	8	11	13
P1905T	B1 LO2 PMP VOL INT	DGF	BRN	78	78	78	78	78	78
P1906T	B2 LO2 PMP VOL INT	DGF	BRN	78	-288	-287	78	78	78
P1907T	B1 LO2 PMP VOL EXT	DGF	BRN	85	87	72	57	48	40
P1912T	LAUNCHER LO2 OUT	DGF	BRN	85	-174	-196	-241	-261	-250
P1925T	LO2 RECIRC IN	DGF	BRN	78	-294	-293	-293	-296	-292
U1901P	LO2 TK HEAD	%FUL	BRN	0	2	6	14	91	100
U1902P	FUL TK HEAD	%FUL	BRN	0	44	92	100	100	100
U1091V	ERROR RAT DMOD OTP	VDC	BRN					0	4.4

195 421 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.01	2	N1901X	F PREPRES 1 VLV CLSD		X
0.01	48	N1926X	LO2 TK VENT VLV CLSD		X
0.01	58	N1962X	LO2 DRN START SW		X
0.01	72	N1895X	LN2 STK VENT VLV NCL		X
0.02	69	N1892X	LN2 LOAD VLV CLSD		X
0.03	9	N1913X	F PREPRESS VLV 1 OPN		X
0.03	70	N1893X	LN2 LOAD VLV OPN		X
0.03	71	N1894X	LN2 STK P VLV CLSD		X
0.36	62	N1966X	LO2 DRAIN COMPLETE		X
0.54	3	N1902X	F FINE LOAD VLV CLSD		X
0.54	8	N1912X	FUEL LOAD START SW		X
0.54	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.54	15	N1919X	F STK PRESS CLSD		X
0.55	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.55	11	P1966X	F MSL F/D VLV CLSD		X
0.55	13	N1917X	F GRD F/D VLV CLSD		X
0.56	10	N1914X	F FINE LOAD VLV OPEN		X
0.57	14	N1918X	F GND F/D VLV OPEN		X
0.57	26	N1890X	INTER FUL STK PRESS	X	
0.58	12	P1967X	F MSL F/D VLV OPEN		X
0.59	15	N1919X	F STK PRESS CLSD	X	
0.62	15	N1919X	F STK PRESS CLSD		X
0.65	15	N1919X	F STK PRESS CLSD	X	
1.02	17	N1922X	FUL RAPID LD SIGNAL		X
1.77	71	N1894X	LN2 STK P VLV CLSD	X	
2.02	18	N1923X	FUL RAPID VLV CLSD		X
2.06	15	N1919X	F STK PRESS CLSD		X
2.07	4	N1903X	FUL RAPID LD VLV OPN		X
2.10	15	N1919X	F STK PRESS CLSD		X
2.30	16	N1921X	FUEL LOADING PRESS	X	
2.30	43	N1906X	LO2 FINE LD VLV CLSD		X
2.31	50	N1930X	LO2 GND F/D VLV OPEN		X
2.31	52	N1932X	LO2 TOPPING VLV CLSD		X
2.31	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.31	74	P1894X	LO2 95% EMERG COF		X
2.32	44	N1907X	LO2 STK P VLV A CLSD		X
2.32	49	N1929X	LO2 GND F/D VLV CLSD		X
2.33	51	N1931X	LO2 FINE LD VLV OPEN		X
2.33	53	N1933X	LO2 TOPPING VLV OPEN		X
2.34	54	N1934X	L RAPID LD VLV CLSD		X
2.35	63	N1967X	LO2 MSL F/D VLV OPEN		X
2.35	73	P1673X	INFLT HE COMP		X

195 421 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
2.39	42	N1905X	L RAPID LD VLV OPEN		X
2.46	44	N1907X	LO2 STK P VLV A CLSD	X	
2.46	66	N1891X	LO2 NOT IN UPPER LN		X
2.49	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.50	56	N1949X	LO2 LN LIQ DET/INTRM	X	
2.51	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.71	56	N1949X	LO2 LN LIQ DET/INTRM	X	
3.02	68	F1897X	FLIGHT HE 1 VLV CLSD		X
3.04	68	F1897X	FLIGHT HE 1 VLV CLSD	X	
4.36	27	N1969X	AA FUEL 90% PROBE	X	
4.38	4	N1903X	FUL RAPID LD VLV OPN	X	
4.55	18	N1923X	FUL RAPID VLV CLSD	X	
4.71	79	P1899X	AA PROBE @ STA 910	X	
4.95	78	P1898X	HW PROBE @ STA 910	X	
6.71	29	N1971X	AA FUEL 100% PROBE	X	
6.72	6	P1999X	MSL FUELED 100%		X
6.72	10	N1914X	F FINE LOAD VLV OPEN	X	
6.73	3	N1902X	F FINE LOAD VLV CLSD	X	
6.73	12	P1967X	F MSL F/D VLV OPEN	X	
6.77	11	P1966X	F MSL F/D VLV CLSD	X	
6.84	29	N1971X	AA FUEL 100% PROBE		X
6.85	6	P1999X	MSL FUELED 100%	X	
6.89	17	N1922X	FUL RAPID LD SIGNAL	X	
6.90	17	N1922X	FUL RAPID LD SIGNAL		X
6.91	17	N1922X	FUL RAPID LD SIGNAL		X
6.91	79	P1899X	AA PROBE @ STA 910		X
6.97	79	P1899X	AA PROBE @ STA 910	X	
7.03	55	N1936X	LO2 LOADING PRESS	X	
7.06	44	N1907X	LO2 STK P VLV A CLSD		X
7.29	14	N1918X	F GND F/D VLV OPEN	X	
7.29	19	N1943X	F LN LIQ DET/INTERM	X	
7.32	13	N1917X	F GRD F/D VLV CLSD	X	
7.44	79	P1899X	AA PROBE @ STA 910		X
7.56	76	P1896X	HW PROBE @ STA 888	X	
7.96	65	N1889X	INTER LO2 STK PRESS	X	
8.40	75	P1895X	AA PROBE @ STA 866	X	
8.88	77	P1897X	AA PROBE @ STA 888	X	
8.88	79	P1899X	AA PROBE @ STA 910	X	
9.64	37	P1890X	HW PROBE @ STA 700	X	
9.73	40	P1893X	AA PROBE @ STA 793	X	
9.73	79	P1899X	AA PROBE @ STA 910		X
9.83	79	P1899X	AA PROBE @ STA 910	X	
9.84	38	P1891X	AA PROBE @ STA. 700	X	
10.51	31	N1973X	HW LO2 RAPID SIG/90%	X	

195 421 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
10.53	42	N1905X	L RAPID LD VLV OPEN	X	
10.59	54	N1934X	L RAPID LD VLV CLSD	X	
12.40	46	P1998X	MSL LO2 @ 100%		X
12.41	33	N1975X	HW LO2 FIN SIG 99%	X	
12.41	51	N1931X	LO2 FINE LD VLV OPEN	X	
12.42	53	N1933X	LO2 TOPPING VLV OPEN	X	
12.44	49	N1929X	LO2 GND F/D VLV CLSD	X	
12.44	52	N1932X	LO2 TOPPING VLV CLSD	X	
12.44	63	N1967X	LO2 MSL F/D VLV OPEN	X	
12.45	43	N1906X	LO2 FINE LD VLV CLSD	X	
12.45	50	N1930X	LO2 GND F/D VLV OPEN	X	
12.48	64	N1968X	LO2 MSL F/D VLV CLSD	X	
12.54	66	N1891X	LO2 NOT IN UPPER LN	X	
12.61	50	N1930X	LO2 GND F/D VLV OPEN		X
12.62	49	N1929X	LO2 GND F/D VLV CLSD		X
12.64	49	N1929X	LO2 GND F/D VLV CLSD	X	
12.65	50	N1930X	LO2 GND F/D VLV OPEN	X	
12.80	46	P1998X	MSL LO2 @ 100%	X	
12.81	33	N1975X	HW LO2 FIN SIG 99%		X
13.20	44	N1907X	LO2 STK P VLV A CLSD	X	
13.72	43	N1906X	LO2 FINE LD VLV CLSD		X
13.74	51	N1931X	LO2 FINE LD VLV OPEN		X
13.96	51	N1931X	LO2 FINE LD VLV OPEN	X	
13.96	66	N1891X	LO2 NOT IN UPPER LN		X
13.99	43	N1906X	LO2 FINE LD VLV CLSD	X	
14.16	47	N1925X	LO2 COOLDOWN ST SW		X
14.17	48	N1926X	LO2 TK VENT VLV CLSD	X	
14.48	47	N1925X	LO2 COOLDOWN ST SW	X	
14.49	48	N1926X	LO2 TK VENT VLV CLSD		X
14.66	59	N1963X	L MAIN DRN VLV CLSD		X
14.72	60	N1964X	L MAIN DRN VLV OPEN		X
14.78	50	N1930X	LO2 GND F/D VLV OPEN		X
14.79	49	N1929X	LO2 GND F/D VLV CLSD		X
14.98	64	N1968X	LO2 MSL F/D VLV CLSD		X
15.04	63	N1967X	LO2 MSL F/D VLV OPEN		X
17.62	31	N1973X	HW LO2 RAPID SIG/90%		X
17.63	31	N1973X	HW LO2 RAPID SIG/90%		X
17.65	31	N1973X	HW LO2 RAPID SIG/90%	X	
18.00	73	P1673X	LO2 ST TK FULL	X	
23.26	37	P1890X	HW PROBE @ STA 700		X
23.26	38	P1891X	AA PROBE @ STA 700		X
28.92	40	P1893X	AA PROBE @ STA 793		X

195 421 SEQ DATA

NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
28	N1970X	AA FUEL 95% PROBE
45	P1988X	MSL LO2 @ 95%
57	N1951X	PRESS DUCT FUEL SNSR

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
20	N1955X	FUEL DRAIN START SW
25	N1965X	FUL DRAIN COMPLETE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
34		
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	HW PROBE @ STA 793
67	F1896X	LN2 INFLIGHT HE LOAD

1-95 422 DATE 08-04-59

MEAS #	DESCRIPTION	UNIT	REC	TIME 0	IN 3	MIN 5	8	11	13
F1001P	LO2 TANK HELIUM	PSIG	L/N	2.2	3.5	2.7	2.6	2.5	2.7
F1003P	FUEL TANK HELIUM	PSIG	L/N	9.9	28.8	27.3	57.7	57.8	57.8
F1066P	GO2 BO LN @ ELBOW	PSIG	L/N	2.0	1.7	2.0	2.3	2.3	2.4
F1246P	B TK HE BTLS H1	PSIG	BRN	115	100	1520	2150	3070	3040
F1248P	S TK HE BTLS H1	PSIG	BRN	130	130	1160	2090	3080	3060
F1291P	S CTL BTL H1	PSIG	BRN	130	130	1180	2110	3090	3110
F1770P	LN2 STK ULL	PSIG	L/N	0	114	113	113	112	112
F1952P	LO2 STOR TK PR	PSIG	BRN	0	19	19	103	103	103
F1953P	FUEL STORAGE TK PR	PSIG	BRN	5	111	115	120	120	120
F1105R	LN2 FLOW	GPM	L/N	0	96	98	99	99	98
F1004T	FUEL TANK HE	DGF	BRN	119	135	89	89	88	87
F1064T	GO2 BO @ ELBOW	DGF	BRN	98	85	-203	-171	-208	-263
F1247T	B TK HE BTL	DGF	BRN	80	27	-135	-265	-289	-301
F1290T	SUS CTL HE BTLS	DGF	BRN	78	78	78	67	19	26
F1297T	B TK HE BTLS	DGF	BRN	71	3	-166	-285	-295	-310
F1739T	FUEL PRESS GAS	DGF	BRN	120	84	51	84	84	84
F1744T	HE-LN2 HT EXCH OUT	DGF	BRN	33	-12	-300	-307	-300	-283
F1805T	PRESS GAS MAN	DGF	BRN	83	113	95	65	55	54
F1894T	HE LINE AT STUB UP	DGF	BRN	78	78	-222	-262	-265	-256
F1910T	IN LINE EXT OUT	DGF	L/N	67	53	-250	-266	-266	-258
N1980T	TEMP TO SAMPLE BTL	DGF	BRN	82	81	80	77	74	67
N1983T	FULL FUEL PRESS BTL	DGF	BRN	92	92	89	89	87	87
P1001P	B1 LO2 PUMP IN	PSIG	L/N	2.5	7.2	7.2	21.6	29.0	30.9
P1672P	VERN FUL TK DIF	PID	BRN	1.5	1.5	-0.6	1.1	1.1	1.1
P1816P	LO2 SUBCOOLER	PID	BRN	0	2.4	4.4	78	78	2.0
P1900P	LAUNCHER INLET LO2	PSIG	BRN	7	19	14	65	38	8
P1908P	PRESS DIF FUEL TK	PID	BRN	0	0	0.8	1.2	1.2	1.2
P1950P	LAUNCHER INLET FUEL	PSIG	L/N	9	50	41	14	14	14
P1245R	T SYS FUEL FR	GPM	L/N	0	3940	430	0	0	0
P1020T	B1 LO2 P IN	DGF	BRN	-273	-291	-291	-293	-290	-289
P1054T	B2 LO2 P IN	DGF	BRN	-273	-292	-292	-297	-299	-301
P1530T	SUS LO2 P IN	DGF	BRN	-272	-291	-292	-279	-276	-276
P1700T	FUL STK DISCH	DGF	BRN	98	92	87	87	87	87
P1862T	LO2 SUBCOOLER OUT	DGF	BRN	-42	-209	-270	-284	-289	-283
P1869T	LO2 TPG DISCH	DGF	BRN	66	-112	-248	-280	-283	-278
P1887T	ENG COMP AMB BYCONE	DGF	BRN	105	87	77	67	60	56
P1888T	VERN CTL MAN ENV	DGF	BRN	115	115	106	100	94	89
P1889T	VERN CTL MAN METAL	DGF	BRN	115	115	105	100	94	89
P1903T	LAUNCHER LO2 IN	DGF	BRN	78	-214	-251	-272	-273	-186
P1904T	B2 LO2 PMP VOLUTE EX	DGF	BRN	95	90	82	75	59	54
P1905T	B1 LO2 VOL IN	DGF	BRN	78	78	78	78	78	78
P1906T	B2 LO2 VOL INT	DGF	BRN	78	78	78	78	78	78
P1907T	B1 LO2 PMP VOL EXT	DGF	BRN	105	95	82	70	56	50

1-95 422 DATE 08-04-59

MEAS #	DESCRIPTION	UNIT	REC	0	TIME IN MIN 3	5	8	11	13
P1912T	LAUNCHER LO2 OUT	DGF	BRN	92	-185	-233	-248	-244	-215
P1925T	LO2 RECIRC IN	DGF	BRN	78	-295	-295	-299	-294	-310
U1901P	LO2 TK HEAD	%FUL	BRN	0	3	7	39	96	100
U1902P	FUL TK HEAD	%FUL	BRN	0	51	95	100	100	100
U1091V	ERROR RAT DMOD OTP	VDC	BRN					0	4.4

195 422 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	2	N1901X	F PREPRES 1 VLV CLSD		X
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.01	48	N1926X	LO2 TK VENT VLV CLSD		X
0.01	72	N1895X	LN2 STK VENT VLV NCL		X
0.02	58	N1962X	LO2 DRN START SW		X
0.02	69	N1892X	LN2 LOAD VLV CLSD		X
0.03	9	N1913X	F PREPRESS VLV 1 OPN		X
0.03	70	N1893X	LN2 LOAD VLV OPN		X
0.03	71	N1894X	LN2 STK P VLV CLSD		X
0.44	8	N1912X	FUEL LOAD START SW		X
0.44	15	N1919X	F STK PRESS CLSD		X
0.45	3	N1902X	F FINE LOAD VLV CLSD		X
0.45	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.45	11	P1966X	F MSL F/D VLV CLSD		X
0.45	13	N1917X	F GRD F/D VLV CLSD		X
0.46	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.47	10	N1914X	F FINE LOAD VLV OPEN		X
0.48	14	N1918X	F GND F/D VLV OPEN		X
0.49	12	P1967X	F MSL F/D VLV OPEN		X
0.52	26	N1890X	INTER FUL STK PRESS	X	
0.88	15	N1919X	F STK PRESS CLSD	X	
0.88	17	N1922X	FUL RAPID LD SIGNAL		X
1.87	18	N1923X	FUL RAPID VLV CLSD		X
1.88	71	N1894X	LN2 STK P VLV CLSD	X	
1.90	15	N1919X	F STK PRESS CLSD		X
1.92	4	N1903X	FUL RAPID LD VLV OPN		X
2.14	16	N1921X	FUEL LOADING PRESS	X	
2.16	43	N1906X	LO2 FINE LD VLV CLSD		X
2.16	50	N1930X	LO2 GND F/D VLV OPEN		X
2.16	52	N1932X	LO2 TOPPING VLV CLSD		X
2.17	49	N1929X	LO2 GND F/D VLV CLSD		X
2.17	53	N1933X	LO2 TOPPING VLV OPEN		X
2.17	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.18	44	N1907X	LO2 STK P VLV A CLSD		X
2.19	51	N1931X	LO2 FINE LD VLV OPEN		X
2.20	54	N1934X	L RAPID LD VLV CLSD		X
2.20	63	N1967X	LO2 MSL F/D VLV OPEN		X
2.25	42	N1905X	L RAPID LD VLV OPEN		X
2.26	44	N1907X	LO2 STK P VLV A CLSD	X	
2.35	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.36	56	N1949X	LO2 LN LIQ DET/INTRM	X	
2.36	66	N1891X	LO2 NOT IN UPPER LN		X
2.37	56	N1949X	LO2 LN LIQ DET/INTRM		X

195 422 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
3.04	68	F1897X	FLIGHT HE 1 VLV CLSD		X
3.06	68	F1897X	FLIGHT HE 1 VLV CLSD	X	
4.14	4	N1903X	FUL RAPID LD VLV OPN	X	
4.14	27	N1969X	AA FUEL 90% PROBE	X	
4.22	18	N1923X	FUL RAPID VLV CLSD	X	
4.72	78	P1898X	HW PROBE @ STA 910	X	
4.74	79	P1899X	AA PROBE @ STA 910	X	
5.15	15	N1919X	F STK PRESS CLSD	X	
6.39	6	P1999X	MSL FUELED 100%		X
6.39	10	N1914X	F FINE LOAD VLV OPEN	X	
6.39	29	N1971X	AA FUEL 100% PROBE	X	
6.40	3	N1902X	F FINE LOAD VLV CLSD	X	
6.41	12	P1967X	F MSL F/D VLV OPEN	X	
6.44	11	P1966X	F MSL F/D VLV CLSD	X	
6.52	6	P1999X	MSL FUELED 100%	X	
6.52	29	N1971X	AA FUEL 100% PROBE		X
6.57	17	N1922X	FUL RAPID LD SIGNAL	X	
6.69	55	N1936X	LO2 LOADING PRESS	X	
6.74	44	N1907X	LO2 STK P VLV A CLSD		X
6.93	65	N1889X	INTER LO2 STK PRESS	X	
6.95	14	N1918X	F GND F/D VLV OPEN	X	
6.95	19	N1943X	F LN LIQ DET/INTERM	X	
6.98	13	N1917X	F GRD F/D VLV CLSD	X	
7.04	76	P1896X	HW PROBE @ STA 888	X	
7.05	76	P1896X	HW PROBE @ STA 888		X
7.06	76	P1896X	HW PROBE @ STA 888	X	
7.10	79	P1899X	AA PROBE @ STA 910		X
7.11	77	P1897X	AA PROBE @ STA 888	X	
7.11	77	P1897X	AA PROBE @ STA 888		X
7.24	44	N1907X	LO2 STK P VLV A CLSD	X	
7.27	44	N1907X	LO2 STK P VLV A CLSD		X
7.32	44	N1907X	LO2 STK P VLV A CLSD	X	
7.33	44	N1907X	LO2 STK P VLV A CLSD		X
7.35	75	P1895X	AA PROBE @ STA 866	X	
7.38	79	P1899X	AA PROBE @ STA 910	X	
8.01	77	P1897X	AA PROBE @ STA 888	X	
8.76	37	P1890X	HW PROBE @ STA 700	X	
8.97	40	P1893X	AA PROBE @ STA 793	X	
9.08	77	P1897X	AA PROBE @ STA 888		X
9.31	77	P1897X	AA PROBE @ STA 888	X	
9.35	38	P1891X	AA PROBE @ STA 700	X	
9.62	31	N1973X	HW LO2 RAPID SIG/90%	X	
9.63	42	N1905X	L RAPID LD VLV OPEN	X	
9.67	54	N1934X	L RAPID LD VLV CLSD	X	

195 422 SEQ DATA

TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
11.64	46	P1998X	MSL LO2 @ 100%		X
11.65	51	N1931X	LO2 FINE LD VLV OPEN	X	
11.66	33	N1975X	HW LO2 FIN SIG 99%	X	
11.67	43	N1906X	LO2 FINE LD VLV CLSD	X	
11.68	49	N1929X	LO2 GND F/D VLV CLSD	X	
11.69	50	N1930X	LO2 GND F/D VLV OPEN	X	
11.70	71	N1894X	LN2 STK P VLV CLSD		X
11.76	66	N1891X	LO2 NOT IN UPPER LN	X	
12.33	56	N1949X	LO2 LN LIQ DET/INTRM	X	
12.43	53	N1933X	LO2 TOPPING VLV OPEN	X	
12.45	35	N1977X	HW LO2 TOPG COF SIG	X	
12.45	52	N1932X	LO2 TOPPING VLV CLSD	X	
12.79	56	N1949X	LO2 LN LIQ DET/INTRM		X
13.03	44	N1907X	LO2 STK P VLV A CLSD	X	
13.34	43	N1906X	LO2 FINE LD VLV CLSD		X
13.35	35	N1977X	HW LO2 TOPG COF SIG		X
13.35	53	N1933X	LO2 TOPPING VLV OPEN		X
13.39	53	N1933X	LO2 TOPPING VLV OPEN	X	
13.42	35	N1977X	HW LO2 TOPG COF SIG	X	
13.42	43	N1906X	LO2 FINE LD VLV CLSD	X	
13.56	43	N1906X	LO2 FINE LD VLV CLSD		X
13.58	53	N1933X	LO2 TOPPING VLV OPEN		X
15.15	66	N1891X	LO2 NOT IN UPPER LN		X
15.15	66	N1891X	LO2 NOT IN UPPER LN	X	
18.00	73	P1673X	LO2 ST TK FULL	X	
27.37	33	N1975X	HW LO2 FIN SIG 99%		X
28.12	70	N1893X	LN2 LOAD VLV OPN	X	
28.12	71	N1894X	LN2 STK P VLV CLSD	X	
28.13	69	N1892X	LN2 LOAD VLV CLSD	X	
28.13	72	N1895X	LN2 STK VENT VLV NCL	X	
28.16	63	N1967X	LO2 MSL F/D VLV OPEN	X	
28.20	64	N1968X	LO2 MSL F/D VLV CLSD	X	
33.55	31	N1973X	HW LO2 RAPID SIG/90%		X
39.00	37	P1890X	HW PROBE @ STA 700		X
39.00	38	P1891X	AA PROBE @ STA 700		X
43.19	79	P1899X	AA PROBE @ STA 910		X
44.17	77	P1897X	AA PROBE @ STA 888		X
47.52	75	P1895X	AA PROBE @ STA 866		X
47.52	77	P1897X	AA PROBE @ STA 888	X	
48.74	77	P1897X	AA PROBE @ STA 888		X
48.76	76	P1896X	HW PROBE @ STA 888		X
50.00	78	P1890X	HW PROBE @ STA 910		X

195 422 SEQ DATA

NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
57	N1951X	PRESS DUCT FUEL SNSR
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
20	N1955X	FUEL DRAIN START SW
25	N1965X	FUL DRAIN COMPLETE
28	N1970X	AA FUEL 95% PROBE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
34		
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	HW PROBE @ STA 793
45	P1988X	MSL LO2 @ 95%
62	N1966X	LO2 DRAIN COMPLETE
67	F1896X	LN2 INFLIGHT HE LOAD
74	P1894X	LO2 95% EMERG COF

SECTION 10

Instrumentation Survey

P1906T B2 LO2 PUMP VOL INT: Probe opened up. Measurement was deleted.

INSTRUMENTATION FAILURE CODE

1. TRANSDUCER
   - A. DAMAGED BEFORE TEST
   - B. DAMAGED DURING TEST
   - C. POWER SUPPLY LOSS
   - D. EXCESSIVE ZERO SHIFT IN INSTRUMENTATION SYSTEM
   - E. EXCESSIVE GAIN CHANGE IN INSTRUMENTATION SYSTEM
   - F. OPEN CIRCUIT
   - G. WATER IN TRANSDUCER
   - H. SHORTED
   - I. EXCESSIVE RANDOM NOISE

2. GRAPHIC RECORDER
   - A. DATA PEN NOT WRITING
   - B. TIMING PEN NOT WRITING
   - C. PAPER DRIVE STOPPAGE
   - D. RAN OUT OF PAPER DURING TEST
   - E. EXCESSIVE RANDOM NOISE
   - F. NO TIMING
   - G. OFF SCALE
   - H. PAPER DRIVE ON SLOW SPEED

3. OSCILLOGRAPHIC
   - A. EXCESSIVE RANDOM NOISE
   - B. BAD GALVANOMETER
   - C. NO TIMING LINES
   - D. NO TRACE IDENTIFIERS
   - E. GALVANOMETER NOT SUITABLE
   - F. RAN OUT OF PAPER DURING TEST
   - G. PAPER DRIVE FAILURE
   - H. NO TIMING CORRELATION

4. MAGNETIC TAPE RECORDERS
   - A. SIGNAL OUT OF BAND
   - B. EXCESSIVE SIGNAL DROPOUT
   - C. EXCESSIVE RANDOM NOISE
   - D. 60 CPS DISTURBANCE
   - E. 400 CPS DISTURBANCE
   - F. NO USEABLE TIMING
   - G. NO SPEED LOCK-USED EXTERNAL SPEED LOCK
   - H. NO USEABLE 100 KC CORRECTION
   - I. NO USEABLE VOICE
   - J. WRONG TAPE SPEED
   - K. FAULTY TAPE

5. TELEMETRY /NOT APPLICABLE/

6. PRE-TEST MEASUREMENT CALIBRATION
   - A. NEVER CALIBRATED
   - B. NO USEABLE ZERO LEVEL
   - C. NO USEABLE SENSE STEPS
   - D. CALIBRATION NOT RECEIVED FROM TEST SITE
   - E. CALIBRATION SUSPECTED TO BE INVALID

7. INSTRUMENTATION PROCEDURE
   - A. WIRING REVERSED
   - B. CALIBRATION RANGE INADEQUATE
   - C. SYSTEM SENSITIVITY TOO HIGH
   - D. SYSTEM SENSITIVITY TOO LOW
   - E. IMPOSSIBLE TO MAKE MEASUREMENT
   - F. MEASUREMENT NOT ATTEMPTED
   - G. IMPROPER WIRING CONNECTION

8. MISCELLANY
   - A. RECORD DAMAGED AT TEST SITE
   - B. RECORD DAMAGED IN TEG
   - C. RECORD NOT SENT TO TEG
   - D. RECORD LOST IN TEG
   - E. RECORD NOT IDENTIFIED AT SITE
   - F. OSCILLOGRAPH DEVELOPMENT FAULTY
   - G. TRANSDUCER NOT MOUNTED PROPERLY
   - H. TRANSDUCER MNTD AT WRONG PLACE

SECTION 11

Test Preparations (Run 420)

PRECOUNTDOWN SUMMARY

Precountdown operations were started at 0915 hours on 29 July 1959 and completed at 1130 for a consumed time of 135 minutes.

COUNTDOWN SUMMARY

Test Date: 29 July 1959
Start of Countdown: 1140 PDT

COUNTDOWN TIME VS. EVENTS

Time	Event
1140	T-14, systems ready report
1141	T-13, fuel prevalves open
1142	T-12, load start
1144	93% FU failed probe activated
1144:20	Helium load start
1144:40	Fuel and LO2 load start
1153	Helium complete, LN2/Helium to topping
1158:25	LN2/Helium topping stop, helium dump
1159	Restep FCU to standby
1202	Fuel drain start
1202:45	Fuel drain stop, secure

Test Preparations (Run 421)

PRECOUNTDOWN SUMMARY

Precountdown operations were started at 1015 hours on 30 July 1959 and

completed at 1135 hours for a consumed time of 80 minutes.

COUNTDOWN SUMMARY

Test Date: 30 July 1959
Start of Countdown: 1145:25 PDT

COUNTDOWN TIME VS. EVENTS

Time	Event
1145:25	T-14, systems ready report
1146:25	T-13, fuel prevalves open
1147:25	T-12, load start
1149:30	Fuel rapid load open
1150:25	Helium load start
1150:40	Fuel at 50%
1151:50	93% light on, fuel rapid load closed
1154:10	100% light on, fuel fine load closed
1154:30	LO2 load start
1154:45	Fuel line drain complete
1156:45	LO2 at 50%
1157:55	93% light on, LO2 rapid load closed
1159:45	Helium complete
1159:50	100% light on, LO2 fine load closed
1200:05	Flight pressurization
1202	Vent LO2 storage tank to 60 PSIG
1202:20	Start manual LO2 drain
1206	Restep PCU to Sequence II L
1215:25	LN2/Helium topping stop, helium dump

Time	Event
1225:25	LO2 drain complete, restep PCU to standby
1226	Fuel drain start
1234:45	Fuel drain complete

Test Preparations (Run 422)

PRECOUNTDOWN SUMMARY

The test article and facility were held in a ready condition following Run 421. Verification of readiness was completed at 1530 hours.

COUNTDOWN SUMMARY

Test Date: 30 July 1959
Start of Countdown: 1533:50

COUNTDOWN TIME VS. EVENTS

Time	Event
1533:50	T-14, systems ready report
1534:50	T-13, fuel prevalves open
1535:50	T-12, load start
1537:48	Fuel rapid load open
1538:50	Fuel at 50%, helium load start
1540:03	93% light, fuel rapid load closed
1542:15	100% light on, fuel fine load closed, fuel complete
1542:20	Restep PCU to Sequence II L
1542:35	LO2 load start
1542:55	Fuel line drain complete
1544:19	LO2 at 50%

Time	Event
1545:30	93% light on, LO2 rapid load closed
1546	Helium complete
1547:30	100% light on, LO2 fine load closed
1548:25	LO2 line drain, top for 15 minutes
1554	Wind condition: 5 knots, E
1603:15	Lost 100% LO2 light
1604	LN2/Helium topping stop, LO2 topping stop, helium dump
1604:40	Flight pressurization achieved
1605	Refill LO2 line
1605:20	Vent LO2 storage tank to 50 PSIG
1606	Begin manual LO2 drain
1609:25	93% light out, LO2 drain stop, restep PCU to Sequence II L
1609:45	Begin manual LO2 drain again
1611:30	Go to automatic LO2 drain
1629	LO2 drain complete, restep PCU to standby
1629:50	Fuel drain start
1638:20	Fuel drain complete, begin securing

APPENDIX I

Tables and Figures

TABLE 1

HE/LN2 DATA

	INFORMATION		420	421	422
A.	LN2 Flow Data				
1.	LN2 Flow Rate (F1105R)				
	a. High flow rate	(GPM)	98	98	98
	b. High flow duration	(MIN)	13	13	13
	c. Topping flow rate	(GPM)	4	4.5	4
	d. Topping flow duration	(MIN)	3	15	15
2.	LN2 Stk Tk (F1770P)	(PSIG)	113	113	113
B.	Helium Flow Data				
1.	Set point	(PSIG)	6.7	6.7	6.7
2.	B Btl Avg Flow Rate	(LBS/MIN)	14.6	14.8	14.9
3.	S Btl Avg Flow Rate	(LBS/MIN)	N/A	N/A	N/A
4.	Ctl Btl Avg Flow Rate	(LBS/MIN)	.7	.6	.6
5.	Avg Tot Flow Rate	(LBS/MIN)	—	—	—
C.	Data at 11 Minutes				
1.	B Btl Temp				
	a. F1247T	(DGF)	-278	-290	-289
	b. F1297T	(DGF)	-292	-300	-295
2.	B Btl Press	(PSIG)	3070	2700	3060
3.	S Btl Temp	(DGF)	Deleted	Deleted	Deleted
4.	S Btl Press	(PSIG)	3030	2650	3075
5.	Ctl Btl Temp	(DGF)	43	31	19
6.	Ctl Btl Press	(PSIG)	2990	2660	3090
D.	Data at 13 Minutes				
1.	B Btl Temp				
	a. F1247T	(DGF)	-291	-294	-299
	b. F1297T	(DGF)	-303	-304	-310
2.	B Btl Press	(PSIG)	3070	3080	3040
3.	S Btl Temp	(DGF)	Deleted	Deleted	Deleted
4.	S Btl Press	(PSIG)	3040	3050	3060
5.	Ctl Btl Temp	(DGF)	45	25	26
6.	Ctl Btl Press	(PSIG)	3010	3070	3060

TABLE 1 Con't

			420	421	422
E.	Data Prior to HE Dump	(MIN)	16	28	28
	1. B Btl Temp				
	a. F1247T	(DGF)	-301	-313	-313
	b. F1297T	(DGF)	-313	-322	-325
	2. B Btl Press	(PSIG)	3070	3030	3010
	3. S Btl Temp	(DGF)	Deleted	Deleted	Deleted
	4. S Btl Press	(PSIG)	3040	3050	3040
	5. Ctl Btl Temp	(DGF)	48	44	46
	6. Ctl Btl Press	(PSIG)	3020	3040	3060
F.	Temperature at "O" Time				
	1. F1247T B Tk He Btl	(DGF)	86	86	86
	2. F1297T B Tk He Btl	(DGF)	81	82	77
	3. F1249T S Tk He Btl	(DGF)	Deleted	Deleted	Deleted
	4. F1290T Ctl Tk He Btl	(DGF)	94	96	Off Scale
	5. F1887T Eng Comp Amb by Cone	(DGF)	87	90	105
	6. F1888T V Ctl Man Env	(DGF)	94	95	115
	7. F1889T V Ctl Man Metal	(DGF)	92	95	115
G.	Other Data				
	1. Time to Ultimate B Press	(MIN)	7.6	9.3	10.1
	2. Press at Above Time	(PSIG)	2700	2640	3080
	3. B Btl Temp at Above Time				
	a. F1247T	(DGF)	-248	-278	-281
	b. F1297T	(DGF)	-270	-289	-289
	4. Helium Loading Delay	(MIN)	2	3	3

TABLE 2 - BOOSTER PRESSURE DROOP HISTORY

NOTES:

1. All times from fuel load start.
2. Point 2 included only if it appeared.
3. # - Run prematurely terminated.
4. ## - PT-21 set low.

INFORMATION	409	410	411	412	413	414	415	416	417	418	419	420	421	422
1. Point 1 Pressure (PSIG)	3000	3040	3050	3110	3000	*	2860	3070	2880	3010	2780	2700	2640	3080
@ Time (MIN)	4.3	4.2	9.9	5.4	4.9		8.2	9.1	9.6	6.7	9.3	7.3	9.3	10.1
2. Point 2 Pressure (PSIG)	2960	3020	---	3090	---	*	---	---	---	3010	---	2670	2650	---
@ Time (MIN)	5.4	5.7	---	6.0	---		---	---	---	7.6	---	8.0	9.7	---
3. Point 3 Pressure (PSIG)	2670	2750	3000	2820	2630	*	2690	3030	2710	2780	2690	2570	2570	**
@ Time (MIN)	6.2	6.5	10.1	8.0	6.5		9.1	11.0	10.5	8.7	10.3	8.5	10.2	
4. Point 4 Pressure (PSIG)	3010	3040	3330	2120	2020	*	2860	3030	3060	3040	3060	3070	3080	3040
@ Time (MIN)	9.0	8.4	10.1	9.3	9.0		12.1	13.0	11.9	9.6	12.6	10.9	13.0	12.0
5. Calculated He Flow Rate (#/MIN)	13.2	13.8	15.3	12.0	12.5	*	13.7	11.5	14.4	16.9	14.1	14.6	14.8	14.9
6. He Loading Delay	---	---	4	None	None	*	2	2	1	1	3	2	3	3

TABLE 3 - GO2 SAMPLING DATA

Sample No.	% Tank Level	Press	% He	% 02**	% N2**
1	30	31	23.3	99.3	.7
2	80	33	22.8	98.3	1.7
3*					
4	20	9	57.8	99.4	.6
5	95	29	21.0	99.2	.8
6	70	13	53.4	99.6	.4
7	60	14	42.9	99.3	.7
8	40	13	46.5	99.2	.8

* Sample 3 was inoperative during Run 421.
** % 02 and N2 are shown in % of remaining sample after HE is removed.

LO2 storage tank sample:	% 02	% N2
Before Run 421	99.7	.3
After Run 421	99.6	.4

Sample No.	% Tank Level	Press	% He	% 02**	% N2**
1	30	29	27.7	99.2	.8
2	80	31	23.6	99.7	1.3
3*					
4	20	7	61.6	99.3	.7
5	95	28	22.9	99.3	.8
6	80	12	46.5	99.1	.9
7	60	11	46.7	99.2	.8
8	40	10	40.9	99.2	.8

* Sample 3 was inoperative during Run 422.
** % 02 and N2 are shown in % of remaining smaple after HE is removed.

LO2 storage tank sample:	% 02	% N2
Before Run 422	99.9	.1
After Run 422	99.9	.1

The results on Run 422 are questionable due to the bottle samples being left over night before the analysis were made.

TABLE 4

Acoustica Performance-Run 421

MISSILE STATION NUMBER				PERCENT OF FULL TANK			
Control Sensor	Per Print	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication	U1091V Error Demod
90% Probe	582.4	579.6		89.4	89.9		**90.0
95% Probe	549.8	*		94.5			
99.8 % Probe	503.3	504.6	503.0	99.8	99.6	99.8	**104.7
LO2 Topping	500.5	*		100.0			
LO2 Overfill	496.0	*		100.4			
String A							
6	910.3	909.4		6.3	6.5		
5	887.8	887.3		11.9	12.3		
4	865.8	*					
3	792.8	*					
2	700.5	690.8		61.2	64.0		
90% Fuel Probe	960.5	959.6		90.3	90.7		
95% Fuel Probe	933.0	932.3	934.9	100.0	100.1	99.5	

TABLE 4 Con't

MISSILE STATION NUMBER				PERCENT OF FULL TANK			
Control Sensor	Per Print	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication	U1091V Error Demod
Fuel continued							
100% Fuel Probe	933.0	932.3	934.9	100.0	100.1	99.5	
100.2% Fuel Probe		*					
Detanking							
90% LO2***	582.4	587.9		89.4	88.8		**88.9
Probe 2	700.5	701.1		61.2	61.0		
Probe 5	887.8	903.0		11.9	8.2		
Probe 6	910.3	929.5		6.3	2.2		

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

*** Values are corrected for seq. III press.

TABLE 5

Acoustica Performance-Run 422

MISSILE STATION NUMBER				PERCENT OF FULL TANK			
Control Sensor	Per Print	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication	U1091V Error Demod
90% Probe	582.4	579.2		89.4	90.0		91.0
95% Probe	549.8	*		94.5			
99.8% Probe	503.3	504.1	501.9	99.8	99.9	99.9	104.7
LO2 Topping	500.5	502.2	499.8	100.0	99.8	100.1	104.8
LO2 Overfill	496.0			100.4			
String A							
6	910.3	909.9		6.3	6.4		
5	887.8	888.3		11.9	11.7		
4	865.8	*		18.0			
3	792.8	*		37.1			
2	700.5	689.8		61.2	64.0		
90% Fuel Probe	960.5	960.4	963.7	90.3	90.3	89.1	
95% Fuel Probe	948.0	*		95.3			
100% Fuel Probe	933.0	931.9	935.2	100.0	100.3	99.4	

TABLE 5 Con't

MISSILE STATION NUMBER				PERCENT OF FULL TANK			
Control Sensor	Per Print	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication	U1091V Error Demod
Fuel continued							
100.2 % Fuel Probe		*					
Detanking							
90% LO2***	582.4	591.4		89.4	87.7	87.2	85.7
Probe 2	700.5	701.1		61.2	61.0		
Probe 5	887.8	887.8		11.9	11.9		
Probe 6	910.3	909.9		6.3	6.4		

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

*** Values are corrected for seq. III press.

FIGURE 1

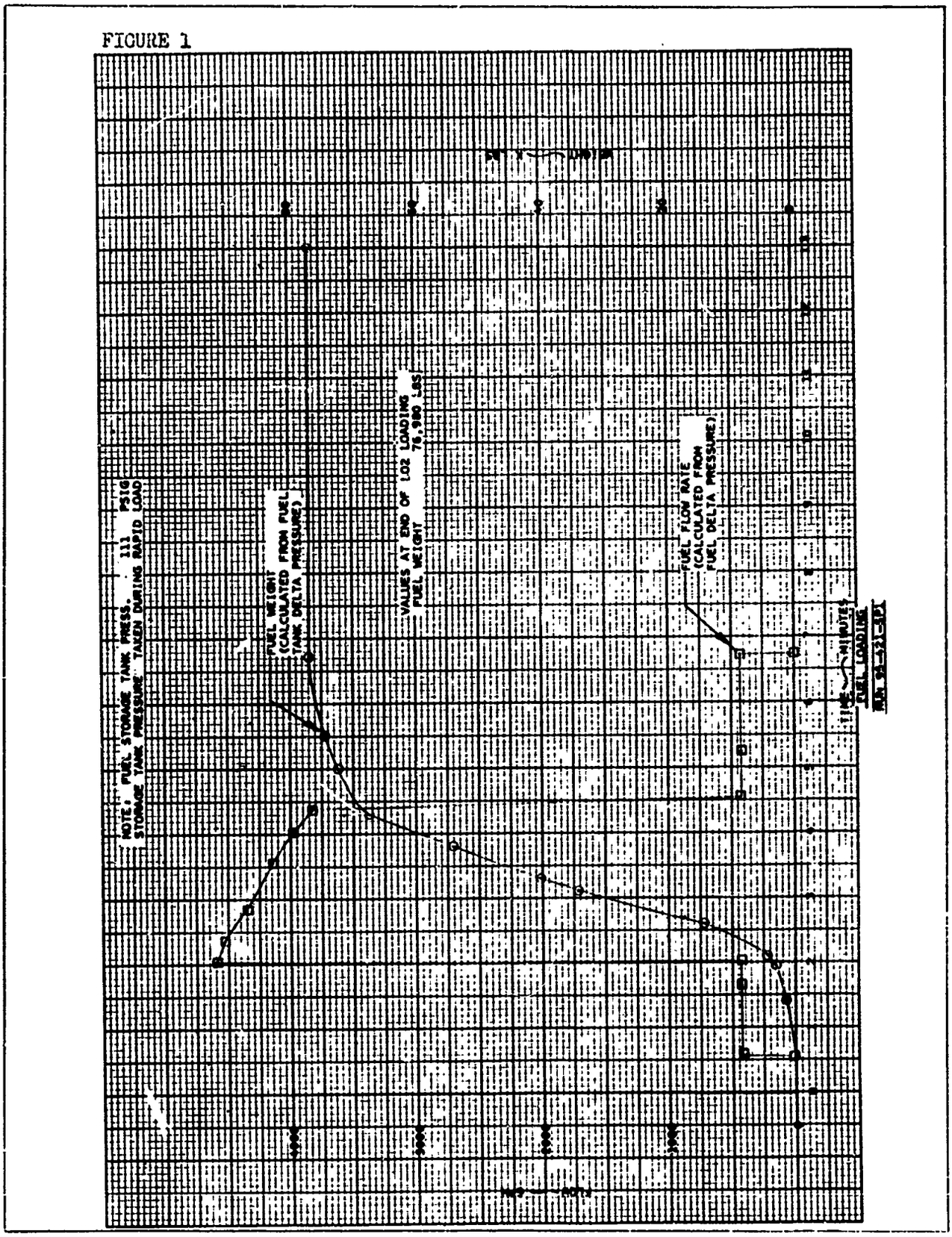

FIGURE 2

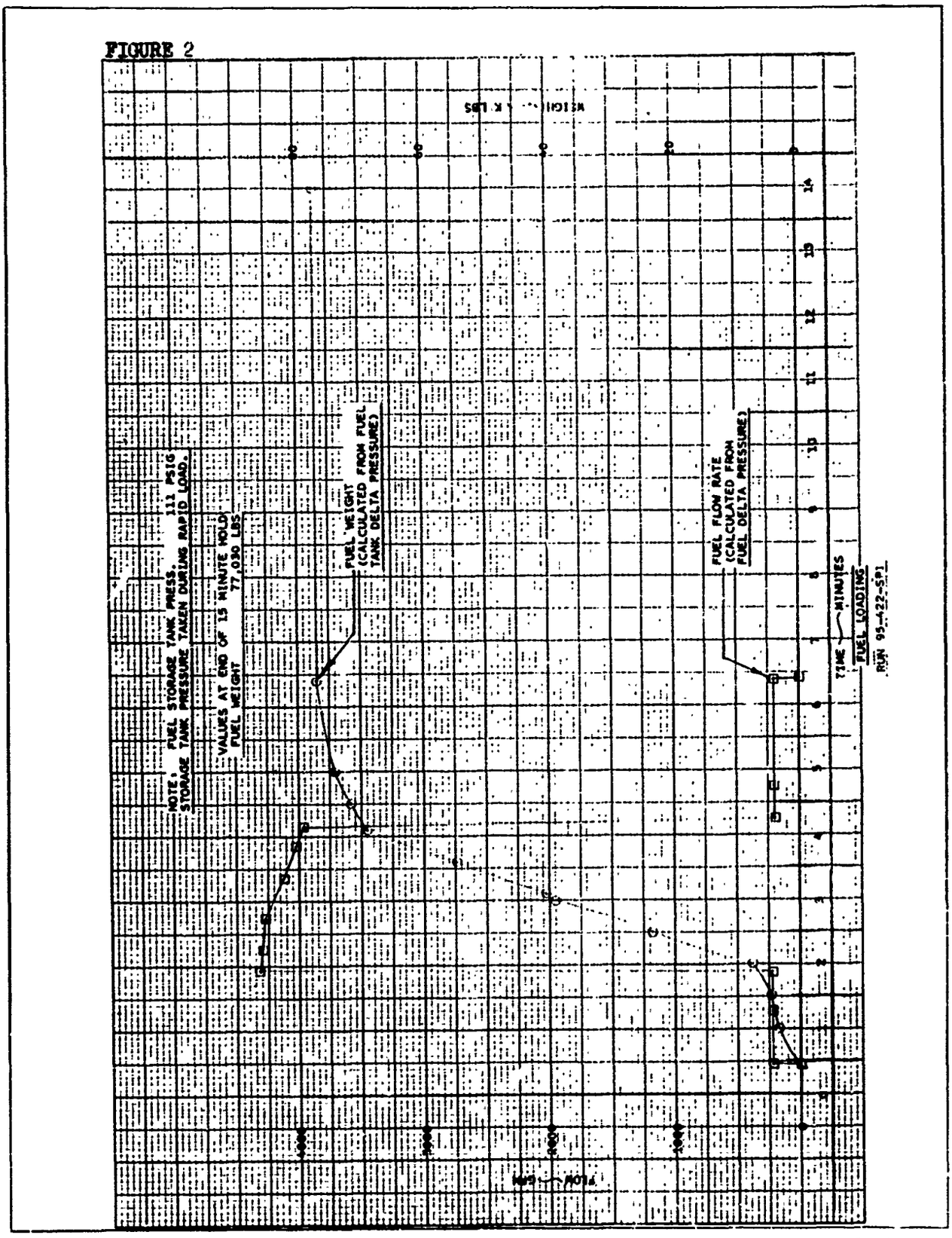

FIGURE 3

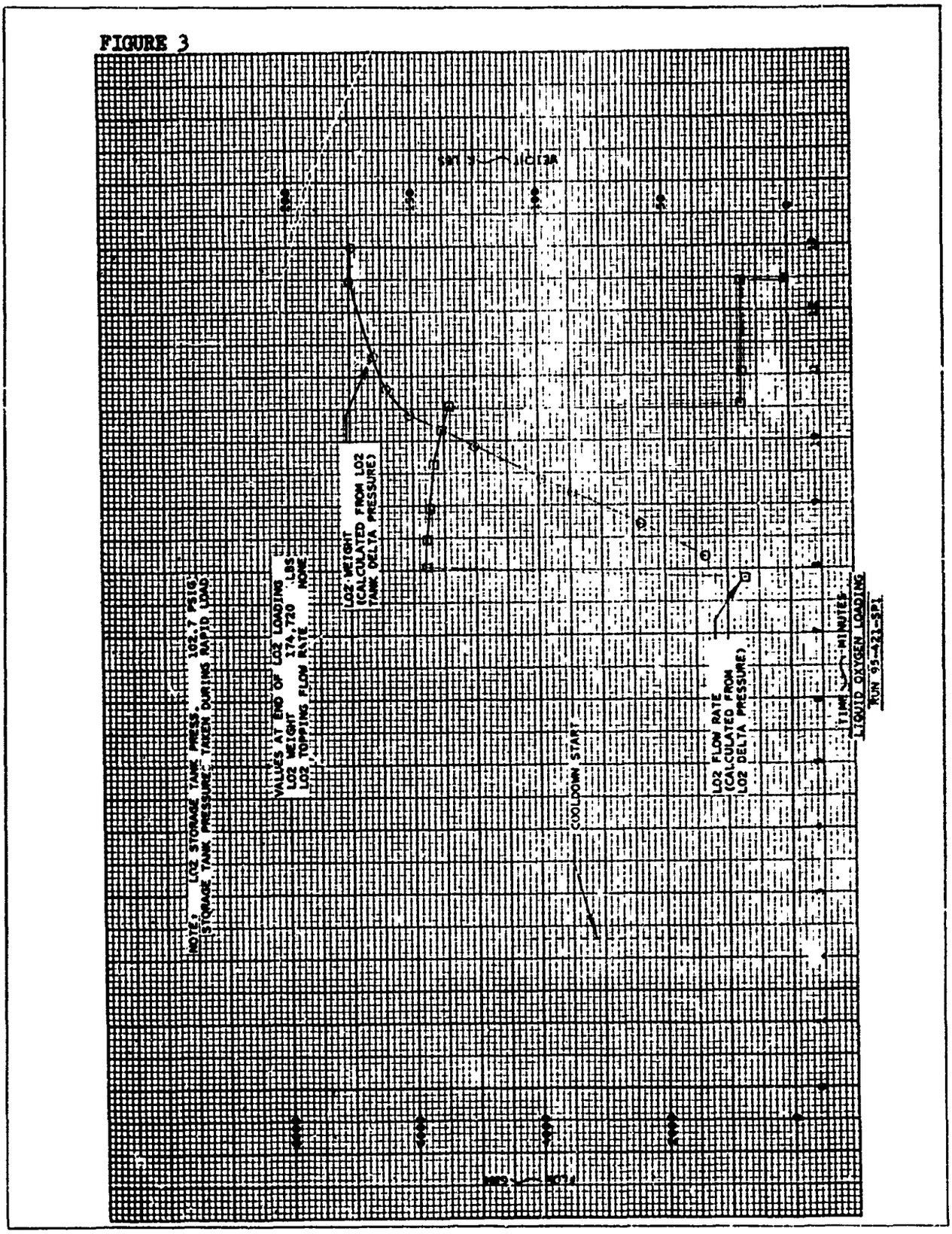

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FIGURE 4

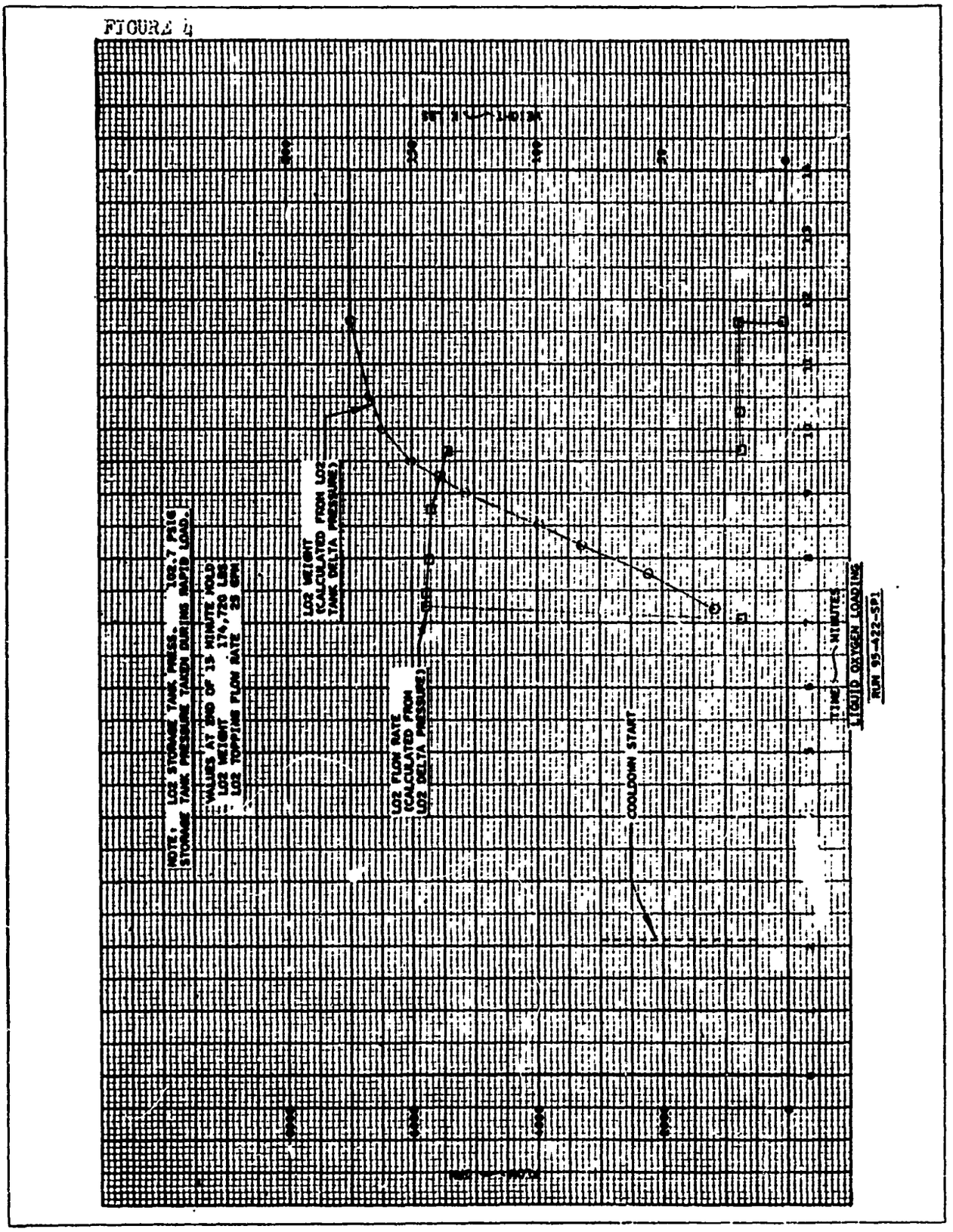

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FIGURE 5

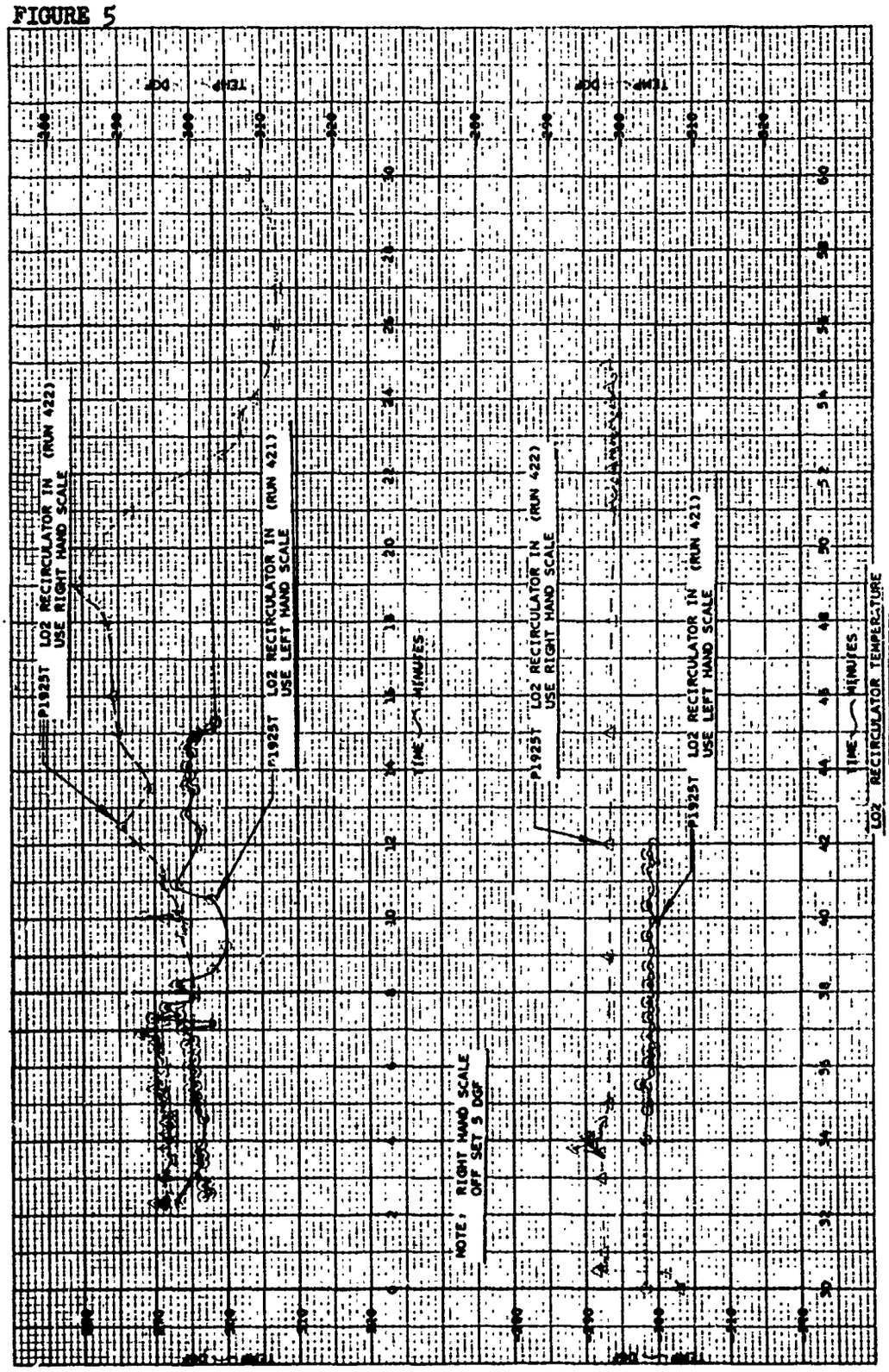


FIGURE 6

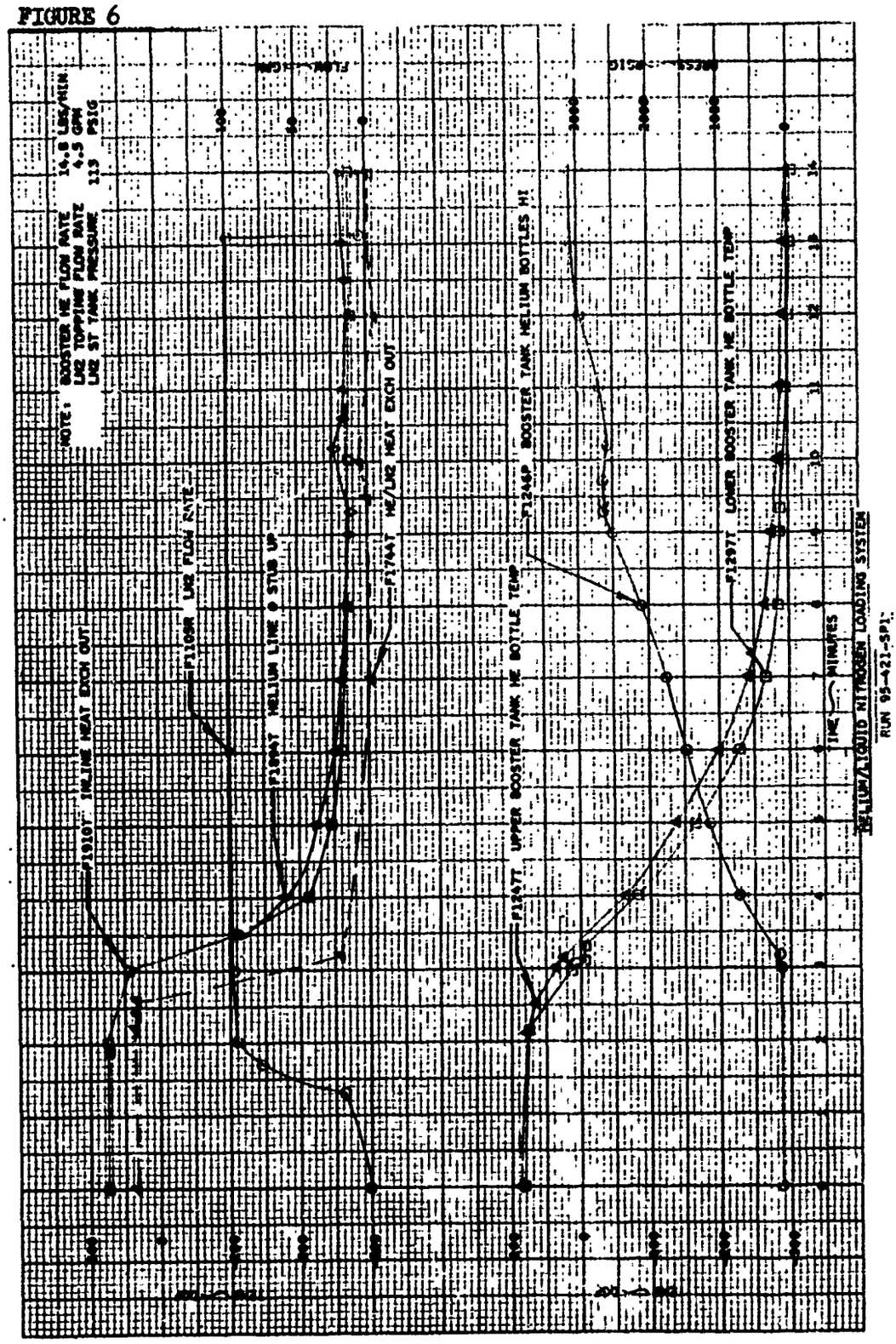


FIGURE 7

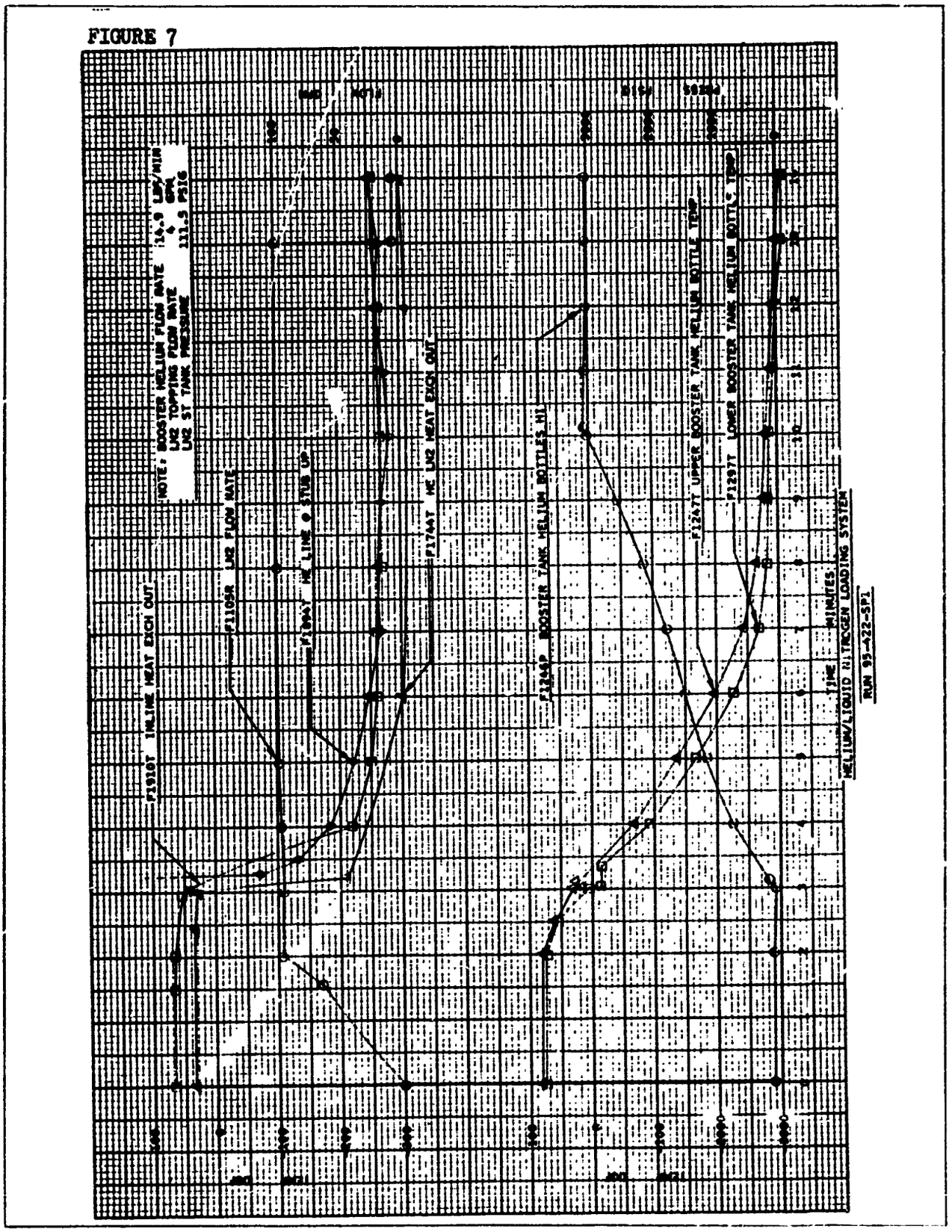
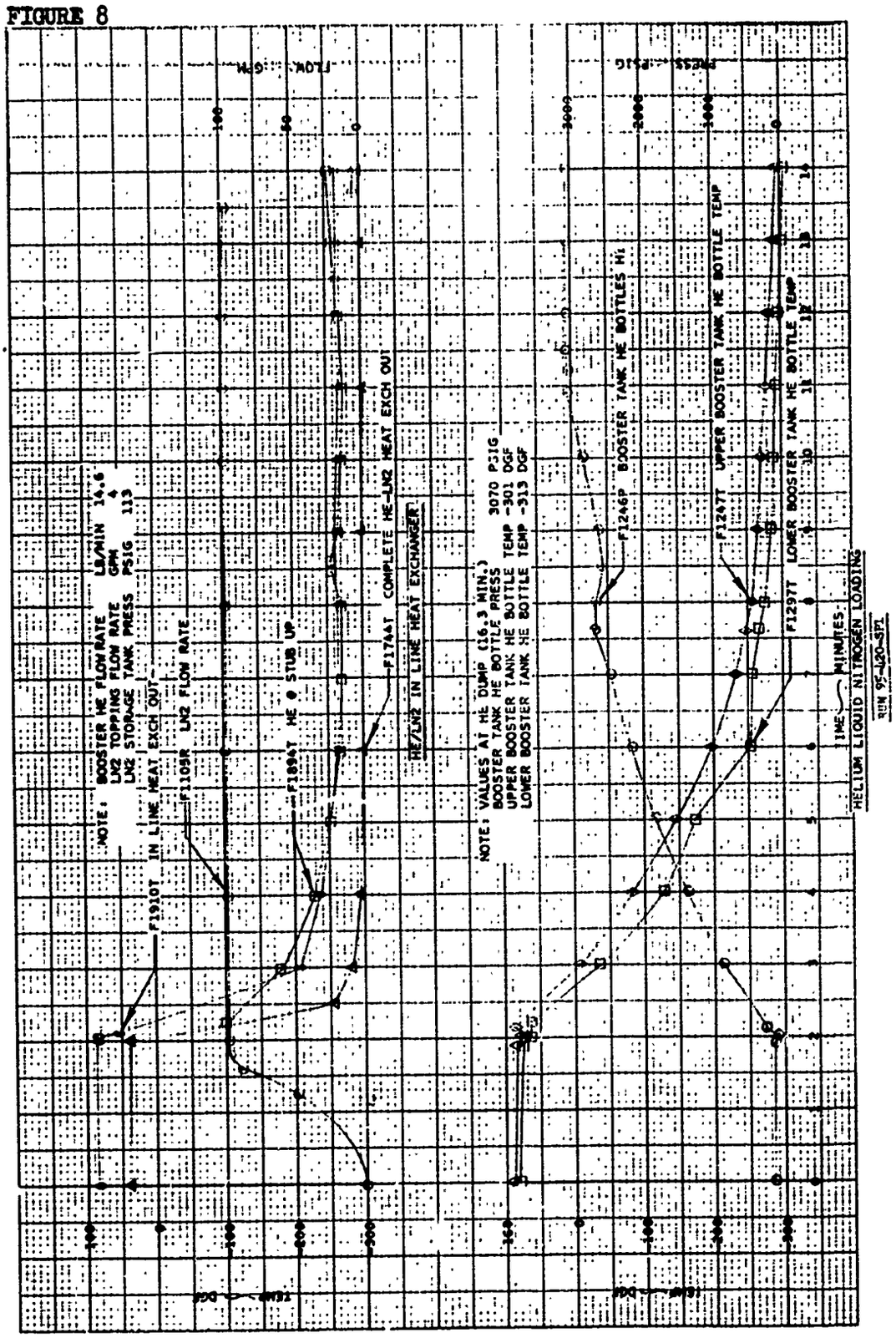


FIGURE 8



APPENDIX II

Operating Conditions

RED LINE VALUES EXCEEDED

No red line values were exceeded during Runs 420, 421 and 422. Red line values are tabulated in Test Directive ETD-OPH-5.

AMBIENT CONDITIONS

Run 420

Ambient Temperature:	96 DGF
Barometric Pressure:	27.425 In. Hg.
Relative Humidity:	10%
Wind Velocity:	4 Knots
Wind Direction:	WSW

Run 421

Ambient Temperature:	94 DGF
Barometric Pressure:	27.550 In. Hg.
Relative Humidity:	13%
Wind Condition:	Calm

Run 422

Ambient Temperature:	104 DGF
Barometric Pressure:	27.500 In. Hg.
Relative Humidity:	13%
Wind Condition:	Calm

APPENDIX III

Test Article History

CONFIGURATION

The Phase III test article, missile assembly version number 7-31-27 is installed in the 1-95 Test Stand as required per 7-00027. This is a simulated operational missile which consists of "A", "B", "C" and "D" series components. These components are described in detail in the Block I Test Directive, Report No. ETD-OPH-4D. No significant changes have been made since the "D" revision, except as follows:

TVA 91457 authorizing connection of the Convair PLCU control units to Acoustica probes in the missile fuel tank has been cancelled and the Acoustica control units were restored to original configuration per TVA 91457B.

The Acoustica PLCU system was connected to control LO2 and fuel tanking per ETP-U-011.

Four Acoustica Control Units (P/N 50025219) for fuel tank probes were removed and replaced with Convair 7-04393-1 Control Units (Acoustica Model 810135, P/N 79404308).

TVA 91191B, change (7-89469) remove extension from engine LO2 tank vent line (29 July 1959).

TVA 91515 (7-89482) installs insulation on helium line between heat exchanger and helium ground disconnect (30 July 1959).

TVA 91517 (7-29232) installs insulation on all LO2 topping line swivel joints (30 July 1959).

TVA 91516 (7-20220) installs insulation on LO2 "Y" duct and LO2 staging valve (30 July 1959).

GMA 5127 (7-86042) installs insulation on LO2 topping line from discharge of LO2 subcooler to wall of transfer room (30 July 1959).

TVA 91508 (7-89482) removes orifice from LN2 exhaust port (30 July 1959).

PROCEDURE HISTORY (Runs 420, 421 & 422)

Date	Procedure Used		Objectives	Results
28 July	ETP-F-053	Gas Sampling Bottles Checkout	Check out Gas Sampling System for GN2 contamination study.	Satisfactory
29 July	ETP-U-012	Acoustica Setup Pre-countdown	Set up Acoustica PLCS in preparation for Countdown, Run 420.	Satisfactory
29 July	ETP-M-004	Precountdown	Prepare for Countdown, Run 420.	Satisfactory
30 July	ETP-U-C12	Acoustica Setup Pre-countdown	Set up Acoustica PLCS in preparation for Countdown, Runs 421 and 422.	Satisfactory
30 July	ETP-M-004	Precountdown	Prepare for Countdown, Runs 421 and 422.	Satisfactory
30 July	ETP-F-053	Gas Sampling Bottles Checkout	Check out Gas Sampling System for GN2 contamination study (Run 422).	Satisfactory

PROBLEM HISTORY

Run 420 was terminated by activation of the Acoustica 95% fuel level probe. Post test investigation revealed the system to be operating satisfactorily. The system operated satisfactorily during Runs 421 and 422.

No other problems were encountered during this period.